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FEDERAL-GRANT RESEARCH

at the

STATE AGRICULTURAL

EXPERIMENT STATIONS

Projects on

RADIOACTIVITY

Part 25

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

Compiled December 1958 by

The State Experiment Stations Division, Agricultural Research Service, U.S. Department of Agriculture, Washington 25, D. C., for use of workers in agricultural research in the subject-matter areas presented. For information on specific research projects write to the Director of the Station where the research is being conducted.

Issued December 1958

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INTRODUCTION

This compilation is one of a series providing information on State agricultural experiment station research supported by Federal-grant funds appropriated annually by Congress under authorization of the Hatch Act of 1887, as amended and approved Aug. 11, 1955, and Section 204(b) of the Agricultural Marketing Act of 1946. It is prepared for use by research workers in the subject-matter areas presented. Only that part of each State's research program supported by Federal-grant moneys is included.

In addition to the Federal-grant moneys, the State experiment stations receive some Federal support through cooperative agreements or contracts with the U. S. Department of Agriculture. Information on such research, along with other departmental research, is available in the Central Project Office, Agricultural Research Service.

A substantial part of each State agricultural experiment station's research is supported with moneys appropriated by the respective State or Territorial Legislatures and through other forms of private and public financing. Information on current agricultural research at the stations which is not financed under the Federal-grant program or through USDA cooperation can be obtained from experiment station directors.

The information given in the series of Federal-grant compilations includes the title and objectives of each Federal-grant project pertaining to the subject given on the cover. The identification of each project gives the department(s) conducting the research, the station number of the project, and the number of the regional project if it is a contributing project.

Relevant regional projects, if any, appear at the end of the compilation. States having projects contributing to regional projects are indicated. The Roman numeral (and capital letter) refer to the location in the summary of the contributing project title and objectives. The States are grouped into four major regions. These are designated NC-North Central, NE-Northeastern, S-Southern, and W-Western. The capital letter "M" following the letters for the region indicates regional marketing projects.

RADIOACTIVITY

Radioactive tracer techniques are being used unless otherwise indicated.

Animal Husbandry

- Fla. Investigation of Mineral Nutrition Problems of Livestock Through the Use of Laboratory Animals. To investigate mineral nutrition problems, including mineral interrelationships that occur in farm livestock, using suitable laboratory animals.
Anim. Husb. & Nutr. 346
- Fla. Transfer of Mineral Elements Through the Placenta and Their Distribution in the Fetus. To determine rate and extent of placental transfer of selected mineral elements and to determine distribution of those elements in the fetus.
Anim. Husb. & Nutr. 566
- Fla. The Nutritional Availability of Components of Livestock Feedstuffs. Obtain quantitative evaluation of digestibility, absorption and metabolic utilization of livestock feedstuffs which are readily available but not generally used.
Anim. Husb. and Nutr. 755
- Fla. The Nutritive Value and Storage Characteristics of Cobalt-60 Irradiated Foods and Feeds. Develop techniques for maintaining the nutritive value and palatability and extending storage period of foods and feeds preserved by irradiation with Cobalt-60 at pasteurization and sterilization levels.
Anim. Husb. & Nutr., Food Technol. & Nutr. 849
- Ill. Nutritional Aspects of Aging in Animals. (1) Evaluate impact of aging in animals on requirements for, and metabolism of, certain nutrients. (2) Learn effect of age in rat upon following processes: intestinal absorption of thiamine- C^{14} , cyanoco-balamine- Co^{60} , Ca^{45} ; synthesis of the coenzyme forms of thiamine; occurrence of "bound" and "diffusible" Ca in muscle and liver; uptake of Ca by the bones; digestibility of protein N.
Anim. Sci. 20-357

- Ill. Studies of Trace Mineral Requirements and Metabolism in Animals. Investigate requirements for, and functions and metabolism of, trace mineral elements in several species of animals.
Anim. Nutr., Anim. Sci. 20-359
- La. Nutritional Studies with Beef Cattle with Emphasis Upon Mineral Metabolism. (1) Study and separate the possible factor/s present in or missing from forages that might prevent normal response or development when fed to growing beef cattle. (2) Make special study of "trace mineral" deficiency and excesses and mineral-vitamin-hormone interrelation known to affect animal growth. (3) Apply radio-isotope procedures concurrently with accepted indicator methods for differential measurement of animal growth and response to rations in terms of fat, muscle, and bone. (4) If mineral deficiencies are shown in forage grasses, use radioisotope procedures to learn specific availability and animal requirements. (5) Formulate ration supplements for alleviation of deficiency. (6) Make other needed studies to clarify, evaluate, and separate factor/s associated with this problem.
Anim. Indus. 916
- Mich. The Absorption of Zn^{65} in Pigs and Rats as Related to Dietary Calcium and Phosphorus. Study (1) intestinal absorption of Zn in pigs and rats maintained on various levels of dietary Ca, P and perhaps other minerals; (2) mechanism involved in therapeutic effect of Zn on parakeratosis pigs.
Anim. Husb., Agr. Chem. 825
- Minn. Chemical and Biological Studies on Animal Nutrition. Part of this project is concerned with irradiation of the young dairy calf.
Agr. Biochem. 1506 Coop. ARS, AEC
- Minn. The Relation of Nutrients to Metabolic Processes. A wide variety of techniques and procedures will be used in this project to study with laboratory animals and with tissues derived from them and from larger animals the chemical reactions involved in metabolic processes and the enzymes associated with them. Of the many ramifications of the problem, attention will initially be focused on: (a) the metabolic function of vitamin E, studying (1) the possible importance in enzymic Oxidation-reduction processes of a primary oxidation product of vitamin E which has already been recently discovered and isolated in this laboratory, and (2) the

relation of vitamin E to oxidative phosphorylation processes in the organism; (b) the role of potassium in metabolic phosphorylations associated with the utilization of glucose; (c) the possibility that thyroxine may form a reversible oxidation product; and (d) the nitrogen metabolism in the early postnatal period.

Agr. Biochem. 1508

Okla.

The Availability to Ruminant Animals of Phosphorus in Various Phosphorus Supplements. To learn (1) relationship between P intake and gain in weight, bone calcification, inorganic P level of blood plasma, true digestibility of P and balance of P in steer calves; and (2) availability to steer calves of P contained in certain mineral supplements and feeds.

Anim. Husb., Chem. 880

Tenn.

Mineral Metabolism in Animals. -- I. Absorption, Distribution, and Physiological Behavior of Calcium and Phosphorus in Farm Animals. To (1) determine the normal distribution of these mineral isotopes administered by the various routes to cattle, swine and sheep, and to study thereby in detail the normal absorption, utilization and skeletal metabolism of selected minerals in these animals; (2) measure endogenous losses of calcium and phosphorus and from these values determine maintenance requirements in the various species as a function of age; (3) determine the biological availability of calcium and phosphorus from the common dietary sources of ruminants, and simple stomached animals; and to study the effects of certain factors such as phytates, oxalates, ration, composition, etc., upon the availability; and (4) apply radioisotope procedures concurrently with accepted indicator methods for the differential measurements of animal response to various dietary treatments.

Anim. Husb., Vet. Sci. 63 Coop. AEC

Tenn.

The Effect of Radiation on Reproductive Physiology in Farm Animals. To evaluate effects of acute and chronic irradiation on reproductive physiology and growth in farm animals on (1) semen characteristics; (2) potential fertility in the male; (3) estrual cycle phenomena in the female; (4) potential fertility in female; (5) endocrine system; and (6) growth of young animals.

Anim. Husb. 66 Coop. ARS

Va. The Metabolism of the Major Products of Rumen Fermentation and Gastro-Intestinal Digestion by Tissues from Ruminant Animals. (1) Study relative use of low molecular weight fatty acids and factors affecting their use by ruminant tissue preparations. Learn (2) principal route by which labeled propionate is metabolized by ruminant and nonruminant tissue preparations; (3) effect of age and species differences on ability of tissues to metabolize low molecular weight fatty acids.
Anim. Path., Biochem. and Nutr., Dairy Sci. 86098

Wis. Effect of Vitamins, Amino Acids, and Other Organic Nutrients on the Growth, Milk Production and Reproduction of Animals. To determine factors concerned with the adequate nutrition of farm animals as related to Wisconsin conditions.
Biochem., Anim. Husb. 10

Dairy Husbandry

Calif.
(Davis) The Relation of Dietary Mineral Levels Upon Calcium and Phosphorus Metabolism and the Incidence of Parturient Paresis (Milk Fever) in Dairy Cattle. Learn influence of prepartal dietary mineral intake on Ca, and P metabolism of cow and upon incidence of milk fever. Find palatable ration supplying sufficient nutrients for gestation and that will prevent milk fever, and find management procedures applicable in control.
Anim. Husb., Dairy Indus. 1663 Coop. FES

Kans. A Study of the Intermediary Metabolism of Rumen Micro-organisms with Reference to the Formation of End Products from the Carbohydrates of Roughage. Elucidate mechanisms in formation of end products, as fatty acids, from the carbohydrates of roughage. Study inter-relationship of apparently nonuseful end product methane with production of useful carbonaceous end products. Isolate enzyme systems capable of carrying on one step reactions found in carbohydrate fermentation.
Bact., Dairy Husb. 425 (NC-25) (Also see NC-25, Factors Affecting the Utilization of Feed by Ruminants, Part 4, Section a.)

Mich. Hormone Studies Related to the Physiology of Domestic Animals Including Investigations with Radioactive Isotopes. (1) Study mechanisms of thyroid function and variations in secretion rate of lab. and domestic animals. (2) Learn optimum levels and combinations of hormones for inducing mammary growth and lactation. (3) Investigate gameto-kinetic factor in cattle feces with reference to its specificity for pregnancy diagnosis.
Anim. Husb., Vet. Sci., Dairy Indus. 25

Dairy Technology

- Mich. The Effects of Accelerated Electron on the Physical and Chemical Characteristics of Milk Proteins. To observe effect of accelerated electron radiation on chemical and physical properties of milk protein system.
Dairy, Agr. Engin. 863
- Pa. The Effect of Mutation on Bacterial Enzymes. To determine effect of induced genetic change on enzymes.
Bact. 1165
- Wis. The Physiology of Ultraviolet Mutants of Penicillium Roquefortii. To study physiology of normal and mutant strains of *P. roquefortii* relative to their role in manufacturing better roquefort cheese and of new types of mold ripened cheese.
Dairy and Food Indus. 756

Entomology and Zoology

- Ariz. Insecticide Residues: Their Nature and Persistence on Arizona Crops. (1) Learn nature and persistence of residues of insecticides commonly used for crop protection under weather conditions which prevail in State in such a manner that half-life and dissipation curves can be determined. (2) Assemble information on persistence and degradation of insecticide residues in State sufficient to insure that all official recommendations for chemical control of insects on agricultural crops will be made in compliance with the Miller Amendment to the Federal Food, Drug and Cosmetic Act. (3) Evaluate promising new insecticides in relation to possible residue problems under State conditions. (4) Make related studies of a more basic nature.
Ent. 416 (W-45) Coop. ARS (Also see W-45, Pesticide Residues: Their Nature and Determination in Relation to the Production and Marketability of Agricultural Products, Part 7, Section d.)
- Calif. Deposit of Insecticides and Analysis of Residues. Pursue: (1) use of known analytical methods with samples from experimental plots of field entomologists, (2) development or adaptation of methods for new pesticides, (3) study of degradation and (or) metabolic products to ascertain what substance(s) is most important in a residue.
Ent. and Parasitol. 902-A,B

Hawaii

Insecticidal Formulations and Their Effects on Insects and Plants. To (1) determine effect of physical state of insecticidal formulations on their toxicity to insects; (2) determine tolerance of various subtropical crops to different chemical sprays and dusts; (3) improve or develop effective control of insect pests under Hawaiian conditions through use of proper insecticide formulations.

Ent. 964

Kans.

Mode of Action of Insecticides. Investigate the following in insects and other animals and plants: (1) Rates and routes of entry and distribution of insecticidal chemicals. (2) intoxication processes, (3) detoxication and excretion mechanisms.

Ent. 476

Nebr.

The Effects of Visible Spectrum Irradiation on Growth and Development in Several Species of Insects. (1) Measure effects of exposure by irradiation of delimited areas of the visible spectrum to German cockroach, common milkweed bug, and other selected insects; (2) Learn location of "receptor sites" within insect which are most probably altered as a result of irradiation; (3) Identify particular hormone(s) involved and learn changes resulting from visible spectrum irradiation.

Ent. 569

N.J.

Fundamental Physiological Studies of Mechanisms of Insecticidal Actions. To study modes of action of various types of insecticides and investigate mechanics of resistance so it will be possible to select materials which will circumvent mechanisms of resistance and to introduce chemicals which will inhibit detoxifying enzymes, thus reducing the insect to its former level of susceptibility.

Ent. 206

N. C.

Insect Resistance Toward Insecticides. (1) Learn present level of resistance of various insects to insecticides. (2) Study penetration of insecticides thru the integument of insects as a factor in insect resistance to insecticides.

Ent., Chem. 134

- Oreg. Chemical Aspects of Insecticides and Fungicides. To (1) develop methods for analysis of agricultural products for insecticide and fungicide residues and learn amounts of residues; (2) develop better techniques for applying insecticides and fungicides; (3) study biochemical effects of insecticides and fungicides on plant and animal tissues; and (4) improve formulation methods for pesticides.
Agr. Chem. 85
- Pa. The Effects of Sound and Radio Waves on Insects and Rodents. To (1) study factors influencing audiogenic seizures in rodents and to explore possible uses of these reactions for rodent control; (2) explore possible use of sound waves, in sonic and ultrasonic ranges for repelling and killing insects; (3) find, if possible, auditory end-organs of household insects and study their properties, and (4) explore possible use of radio waves for destruction of insects and study physiological backgrounds of effects of radio waves on insects and fruits.
Zool., Ent. 1115 Coop. USAF-Hawaii
- Wash. Investigation of Insecticide Residues with Radioactive Tracers. To determine persistence, penetration, and translocation of insecticide deposits on plants by means of radioactive tracers, chemical analysis and bio-analysis.
Ent., Agr. Chem. 1109
- Wash. The Synthesis of Radioactive Labeled Systemic Insecticides and Their Plant Metabolic Products. To synthesize labeled systemic insecticides and their decomposition products for use in investigations of the problems involved in application of systemic insecticides to agricultural crops.
Agr. Chem. 1229
- Wis. Biological Activity of Insecticidal Derivatives. To attempt to develop systemic insecticides suited to the individual control conditions present in Wisconsin.
Ent. 822
- Wis. Chemical Nature and Mechanism of Loss of Insecticide Residues on or in Food, Feed and Forage Crops. Study chemical nature of the insecticide degradation products in and on plants and evaluate their toxicological hazard.
Ent. 980 (NC-33) (Also see NC-33, Pesticide Residues on or in Food, Feed and Forage Crops -- Their Magnitude, Character, and Persistence, Part 7, Section d.)

Field Crops

- Alaska Use of Mutagenic Agents in Cereal Crop Improvement.
To (1) aid the development of superior cereal varieties for Alaska through the production of desirable mutations by mutagenic agents, and (2) compare effectiveness of different mutagenic treatments as measured by genetic changes in cereal crops under Alaskan conditions.
Agron. 43 Coop. AEC
- Ind. Genetics and Cytogenetics of Present and Potential Crop Plants. (1) Establish mode of inheritance and interaction of characters in crop plants for which genetic explanation has not been established. (2) Introduce species not studied and establish range of heredity variation in relation to their adaptation. (3) Induce new mutations by ultra-violet light, X-ray, radioactive isotopes, colchicine, mustard gas, hydro-xyquinoline, and by biologic mutagens as Ds-Ac system in corn. (4) Evaluate agents for mutagenic activity thru analysis of mutations produced.
Agron. 831
- Iowa Development of Superior Soybean Strains. To (1) develop new soybean varieties adapted to the various climatic and edaphic conditions in Iowa and superior to those now grown in respect to yield and other agronomic characters, in chemical composition, and in resistance to the major diseases, (2) cooperate with Regional Soybean Lab. FCRB, USDA, in regional testing of soybean varieties, (3) determine value of different breeding methods in soybean improvement and to develop more effective methods of selection, (4) obtain basic data on the inheritance of and nature of gene action, (5) determine the nature of host-parasite relationships, (6) evaluate the disease reaction of breeding material, (7) determine factors that influence the development of soybean diseases.
Agron., Bot. 1179 Coop. ARS
- Kans. Genetic and Applied Cytogenetic Investigations of Farm Crops. To (1) study mode of inheritance of important characters in farm crops to facilitate breeding and selection work in such crops; (2) study chromosomal numbers and behavior in various crop plants and their polyploid, interspecific, or intergeneric hybrid derivatives; and aid in isolation of meiotically stable segregates with desired chromosome numbers; and (3) investigate use of ionizing and related radiations and chemicals for production of favorable mutations and/or polyploids in crop plants.
Agron. 373 Coop. ARS

Mo. The Cytogenetics of Wheat. To (1) get additional information on fundamental genetics of wheat, (2) locate genes on the chromosomes of wheat, and (3) transfer desirable genes to wheat from other genera.

Field Crops 261 Coop. ARS

Mo. Mutation Studies in Arabidopsis Thaliana. Analyze (1) cause of inviability of induced mutants; (2) genes affective metabolic steps using mutants that are unable to carry out the synthesis of essential substances. (3) Learn range and nature of progressive mutation. (4) Study relation of nutritional differences to genetic effects of radiation.

Field Crops 331

Nebr. Cytogenetic Studies of Economic Characters, Such as Stature and Resistance to Bunt and Rust, in Nebraska Winter Wheats by Means of Aneuploids and Irrigation. (1) Substitute individual chromosomes from Nebraska winter wheat varieties, with immediate emphasis on Cheyenne, into a uniform genetic background, as Chinese Spring, to learn effect of specific winter wheat chromosomes. (2) Develop a set of aneuploid stocks in Cheyenne for use in chromosomal substitutions from other varieties, species, or genera. (3) Locate specific chromosomes of genes for characters as stem rust resistance in Cheyenne and stature in various Nebraska selections. (4) Transfer desirable characters from other varieties, species, or genera to Cheyenne by aneuploids and irradiation-induced translocations.

Agron. 536 Coop. ARS

Nebr. Evaluation of Effects of Radiations on Quantitative Characters in Corn as Related to Breeding Improved Varieties and Hybrids. (1) Evaluate and characterize genetic variability induced in quantitative characters yield and in some cases plant height, date of flowering, ear length and height, ear diameter, and number of ears. (2) Predict genetic gain to be expected from selection within a population derived by an irradiation treatment as compared to selection within a control population handled in same way except in irradiation. (3) Compare actual gain realized with predicted gain to check reliability of prediction formulas when applied to irradiated populations. (4) Compare induced mutation rates with natural mutation rates as indicated by genetic variability obtained in inbred lines subjected to irradiation and in control lines treated the same except for irradiation treatment. (5) Learn if use of radiations offers promise in breaking tight linkages between genes.

Agron. 554 Coop. AEC

Nebr. Evaluation of Effects of Radiations on Quantitative Characters in Soybeans as Related to Breeding Improved Varieties.

(1) Evaluate genetic variability induced in the quantitative characters yield, plant height, maturity, oil content, and protein content. (2) Predict genetic gain to be expected from selection within a population derived from irradiated seed as compared to selection in a control population. (3) Observe irradiated populations in all generations and isolate promising genotypes.

Agron. 555 Coop. AEC

N. Mex. The Genetics of Bacterial Blight Resistance and the Value of Osmotic Selection in Upland Cotton. To (1) determine genetic basis of resistance to blight; (2) use induced mutation to obtain blight resistance; (3) determine if and in what way osmotic selection can be of benefit in applied cotton breeding work, and (4) perfect techniques for using osmotic selection to best advantage with cotton.

Agron. 45 (S-1) (Also see S-1, Genetics and Cytology of Cotton, Part 8, Section b.)

N. C. Peanut Breeding and Cultural Investigations. To develop strains of peanuts with greater yielding ability, high oil content, and superior disease resistance; and to determine the relative response of different types or varieties, as measured by both yield and quality, on different soil types and to various cultural practices.

Agron. 50 Coop. AEC

Tex. Improvement of Peanuts Through Breeding and Selection.

To (1) develop new varieties and strains of Spanish type peanuts with resistance to Southern blight, and Cercospora leaf spots, high yielding ability, uniformity of shape and size of seed, and seed dormancy; (2) increase emphasis on assembling and testing of new peanut breeding materials for a substantially higher order of resistance to major diseases; (3) conduct hybridization and selection within groups of new and old breeding materials in the direction of combining high disease resistance with other outstanding characteristics; and (4) use all available genetic techniques in reaching the above objectives, including chemical and radiological methods of modifying germ plasm.

Pl. Path. & Physiol., Agron. 569

Tex. Spontaneous and Induced Modification of the Gossypium Hirsutum Genome. To obtain basic information on the cytogenetics of Gossypium hirsutum, by following these problems: (1) effect of changes in chromosome number, especially effects of individual chromosomes as studied by their addition to, or subtraction from, the hirsutum genome, (2) effect of specific chromosomes or characters from Asiatic and wild diploid species transferred to the hirsutum genome, by addition or substitution, (3) detection of spontaneous and induced intra- and inter-chromosomal changes, and study of their transmission, (4) detection of gene mutations, spontaneous or induced by radiation or mutagens, (5) improvement of techniques of cytology and inter-specific crossing needed for study of above problems, and (6) building of stocks with each chromosome marked with visible, transmissible cytological aberration.

Agron. 859 Coop. ARS

Wash. Fundamental Genetic, Cytogenetic, and Radiobiological Studies in Cereals. Study biological effects of X-rays and other radiations. Utilize ionizing radiation in production of new genetic and cytogenetic phenomena in wheat and barley. Study effect of temperature, atmosphere, moisture, etc., applied before, during, and after radiation in modifying biological effects of X-rays, neutrons, and gamma rays, and the experimental control of induced mutation process. Study spontaneous mutations and chromosomal aberrations.

Agron. 1002 Coop. AEC

Food Science and Technology

Ill. Effect of Low Levels of Ionizing Radiation on the Storage Life of Refrigerated Chicken. To (1) determine effects of low levels of ionizing radiation on storage and marketing of dressed chicken; evaluate storage life, under refrigeration, of irradiated and non-irradiated chicken, and the organoleptic properties of stored chicken at selected intervals during storage.

Food Tech. 50-394

Mich. Irradiation of Fruits and Vegetables. (1) Learn effectiveness of ionizing radiations in extending shelf and storage life of fruits and vegetables. (2) Study undesirable changes in color, texture, and flavor occurring in fruits and vegetables as a result of irradiation. (3) Learn effects of irradiation on metabolic activities of fruit and vegetable tissues.

Hort. 845

- Mich. The Effect of High Voltage Cathode Ray Ionizing Radiation on Some Chemical Properties and on the Biological Value of Wheat Protein. To (1) determine if irradiation has an effect on availability (expressed as biological value) of wheat protein to the animal body; (2) by chemical means study any changes occurring in wheat protein as result of irradiation.
Food and Nutr., Agr. Engin. 864
- Mo. Control of Microbial Development During Meat Processing. To control microbial development during meat processing by use of ultra-violet radiation.
Anim. Husb. 257
- Ohio Comparison of Fruits and Vegetables Processed by Radiation Sterilization with the Same Fruits and Vegetables by Canning and Freezing. (1) Evaluate nutritional and quality differences of fruits and vegetables processed by means of radiation sterilization when compared to same items processed by canning and freezing. Study effects of radiation sterilization on nutritional and quality differences of: (2) several varieties known to differ in their adaptability for canning and/or freezing, for each commodity; and, (3) fruits and vegetables when processed at different maturity stages.
Hort. 152
- Utah Radiation, Pasteurization and Radiation Sterilization of Fruits and Vegetables. Determine effect of different radiation dosages in reducing microbiological contamination and extending shelf-life of products. Measure texture, color, and vitamin content at time of radiation and at intervals during storage.
Hort. Nutr. 472
- Utah Chemical Techniques for Detecting Flavor Changes During Meat Processing. To develop chemical techniques for rapid and reliable evaluation of flavor of processed meat and to correlate chemical techniques for evaluating flavor with organoleptic tests. Irradiation work in progress.
Bot., Plant Path., Food and Nutr. 458

Forage Crops, Pastures, and Ranges

- Fla. Forage and Pasture Grass Improvement by Breeding. Breed forage and pasture grasses having high yielding ability, good nutritive value, resistance to diseases, and tolerance to unfavorable weather.
Agron. 850 Coop. ARS
- Idaho Sulfur Studies on Crops in North Idaho Using Radioactive Sulfur. To (1) compare availability of sulfur to alfalfa, wheat and peas from two main sources, elemental sulfur and gypsum; (2) determine extent of sulfur uptake by those crops at various stages of growth; (3) determine distribution of sulfur; (4) determine effect of sulfur treatments on crop yields; (5) test "A" value concept for sulfur in those crops; and (6) carry over into the second year using alfalfa and peas as crops.
Agr. Chem., Agron. 208
- Kans. The Roles of Zinc and Iron in Alfalfa and the Composition of Zinc Containing Substances in Alfalfa. Learn nature of chemical substances in plants to which Zn is bound, rate of uptake of Zn by plants grown in nutrient solutions, under various conditions and the relationship of Fe and Zn in plants, if such exists. Grow alfalfa in nutrient solutions with added radioactive Zn⁶⁵.
Chem. Bot. 328
- Ky. Evaluating and Breeding Forage Crops. To (1) evaluate species and varieties of forage crops obtained thru introduction, naturalization and breeding; and (2) breed improved varieties of tall fescue, Kentucky bluegrass, and red clover.
Agron. 160 (S-12) Coop. ARS (Also see S-12, Production and Evaluation of Forage Crops and Pastures in the South, Section 10.)
- Mont. The Improvement of Tall, Intermediate, and Pubescent Wheatgrass by Intergeneric Crossing with Wheat.
Agron., Soils, Ms-1083. Coop. Nat'l. Reactor Testing Station
- Tenn. Breeding and Genetics of Crimson Clover. To (1) find a variety resistant to shattering of seed; (2) find a variety later maturing than present ones; and (3) make studies on the genetics and cytology of crimson clover.
Bot. 75
- Va. Evaluation of Radiation Induced Mutations for use in an Alfalfa Breeding Program. (1) Evaluate mutants produced by radiation in view of use in an alfalfa breeding program. (2) Learn radiation dosage and methods required to obtain mutations. (3) Learn frequency and types of mutations produced by radiation.
Agron. 86083

Forestry

Ga. Production of Useful Mutants in Loblolly Pine by Irradiation. To (1) explore possibilities of developing more productive strains of loblolly pine (Pinus taeda L.) from mutants artificially induced by gamma and neutron irradiation of seed and seedlings.

For. 112 Coop. AEC, Oakridge National Lab.

Fruits and Nuts

N.J. Peach Breeding. To (1) develop early ripening, large yellow, freestone peaches; (2) develop freestone fruit that is disease resistant, hardy, large, productive, firm, attractive, good quality, and yellow fleshed, to ripen throughout the season, suitable for dessert fruit and for home and commercial processing; (3) develop clingstone varieties that are disease resistant, hardy, large, productive, good for canning and processing; (4) develop series of large, yellow fleshed, disease resistant, non-cracking, hardy, productive, good quality, freestone nectarines ripening throughout the season; (5) study mode of inheritance of horticulturally important characters; (6) develop methods of testing trees for disease resistance, particularly in seedling stage in greenhouse; (7) develop methods of producing seedlings from embryos of very early ripening peaches; (8) evaluate and use material available such as peento or saucer fruit shape, orange colored flesh, hardy trees, rootstocks, ornamentals, edible seeds, etc.; (9) maintain and assemble peach varieties and selections; and, (10) use promising mutant material from high energy irradiation of peach plant material under project 366.

Hort. 326 Coop. AEC

N.J. Apple Breeding. To (1) develop early ripening, red, firm, high quality, dual purpose varieties, and attractive, dessert quality, dual purpose varieties with a long storage life and good handling properties; (2) use triploid and tetraploid varieties in the breeding program if they possess desirable combinations of characters not present in diploid varieties; (3) use promising mutant material obtained from high energy irradiation of apple material under project 366; (4) develop acceptable commercial varieties throughout the ripening season that are resistant to disease; and, (5) maintain, assemble, and evaluate apple varieties and selections.

Hort. 327

N.J.

Strawberry Breeding. To (1) develop a series of varieties suitable for freezing processing and consider characters as: ease of separation of calyx, small, dry scar, necked fruit shape, medium to large fruit size, uniform light or medium red flesh color, firm flesh, moderately tart or tart, high aroma, tough skin, vigorous and productive plant, strong, upright fruiting cluster; (2) develop series of varieties suitable for fresh market and consider characters as: light, glossy outside red, light colored seeds, showy calyx, disease resistance, virus tolerance; (3) develop commercially acceptable, very early ripening, frost hardy varieties; (4) commercially acceptable everbearing varieties adapted to State; (5) parental material possessing special characters in combination with desirable horticultural characters and consider special characters of very large size, very late ripening, runnerless plants; fairly true breeding lines suitable for production of F_1 hybrid seed-propagated varieties; (6) use mutant material obtained from high energy irradiation of strawberry plant material under Project 366; and, (7) maintain virus-free stocks of selected seedlings and commercially important varieties in cooperation with Project 328.

Hort. 333 Coop. USDA

N.J.

Blueberry Breeding. To (1) develop improved varieties of blueberries in cooperation with USDA, consider various characters as: early ripening, very late ripening, good scar with resistance to shattering, larger size, light blue color, uniform ripening, good keeping and handling quality, etc.; (2) test selections from progenies distributed to other experiment stations and cooperating growers by USDA; (3) supervise testing and increase of promising selections; (4) develop inoculation techniques in cooperation with Departments of Plant Pathology and Entomology and with USDA for evaluation of seedlings and selections for resistance to disease and for virus tolerance; (5) introduce by interspecific hybridization early ripening and hardiness from northern lowbush blueberry and superior scar and drought resistance from rabbiteye blueberry into the high bush variety; (6) use mutant material from high energy irradiation of blueberry plant material under Project 366; and, (7) maintain a variety test planting of commercially important varieties, new varieties, and a "living herbarium".

Hort. 368 Coop. USDA

N.J.

Studies of the Photoperiodic Control of Flower-Bud Formation in Strawberries. To (1) learn time and range of flower-bud initiation in several strawberry varieties and if they are Short Day, Long Day, or indeterminate plants; (2) study inheritance of the flower-bud initiation response in progeny of Sparkle x Gem; and, (3) study effect of far-red irradiation on flower-bud initiation in strawberries.

Hort. 711

Home Economics

Iowa

Sulfonated Sterols in Nutrition. Elucidate action of antirachitic vitamin on theory that in vivo sulfonations are induced by vitamin D. Learn location of sulfonic acid group in antirachitic cholestatetraene sulfonic acid. Synthesize analogous derivatives with and without radioactive carbon. Correlate biological activity.

Chem. 1115

Ornamental and Drug Plants

Storrs
(Conn.)

Cytology and Genetics of Floriculture Crops. (1) Carnations. Work on effects of ionizing radiation in production of mutants in existing commercial clones and new seedlings. Develop analytic techniques for study of somatic mutants and chimeras. Chemically study various breeding types of known genotypes. Further study polyploidy, to develop diploid and tetraploid parent genotypes capable of producing suitable triploids. (2) Orchids. Make further cytological studies correlated with suitable cultural conditions to learn what degree of ploidy is most likely to provide maximum returns and best means of achieving desired degree of ploidy. Make careful meiotic studies of mega- and microsporogenesis of selected types to learn if orchids (not considered as being parthenogenetic) may, under certain conditions, reproduce parthenogenetically. (3) Delphiniums. Test validity of results of studies of origin of D. Belladonna Hort which has indicated that triploids or otherwise sterile hybrids are better keepers for cut flowers than fertile forms, and how these forms can most readily be produced. (4) Lilies. Further study chimeras obtained from use of colchicine administered several years earlier. Continue irradiating commercial clones and new seedlings at suitable dosage rates to learn how readily mutants can be obtained.

Pl. Sci. 169

- Va. Develop, Procure, Propagate, and Test Dwarf, Woody Ornamental Plants. To (1) use certain ornamentals now at VPI Arboretum and produce dwarf types from other sources; (2) develop new forms through hybridization, selection and use of X-ray, chemical, etc. to induce gene mutations; (3) study methods of propagating dwarf plants and response to different chemical fertilizers; and (4) test dwarf ornamentals in various soils and exposures for hardiness, rate of growth and resistance to pests.
 Hort. 86044

Plant Pathology and Bacteriology

- Ala. Nematodes in Relationship to Crop Production in the South. (1) Identity and geographical distribution of nematode populations as to soil characteristics and associated pathological conditions of plants in southern States and Puerto Rico; (2) factors affecting variability in morphological and physiological characters of plant-attacking nematodes; (3) life histories, feeding habits, and host-parasite relations of certain plant-parasitic nematodes; (4) host range of certain specific nematodes; and (5) effect of natural and man-influenced environmental factors upon abundance spatial distribution, activity, and relationships of nematodes and associated soil microorganisms.
 Bot., Pl. Path. 539 (S-19) Coop. ARS (Also see S-19, Plant Parasitic Nematodes, Part 17, Section c.)
- Pa. The Recovery of Microorganisms from Ultraviolet and Visible Light Radiation Damage. To (1) quantitate killing by visible light radiation and observe possible recovery methods; (2) explore possibility that a single mechanism is responsible for most types of recovery; (3) study possible interrelationship between killing and recovery by radiation from ultraviolet and from the visible portion of spectrum.
 Bact. 1289
- Vt. The Biochemistry of Naturally Occurring Flavanoid Compounds. I. Role in Plant Disease Resistance. II. Functions in the Cross. To (1) correlate the presence of flavanoid compounds with disease resistance in plants, particularly in Impatiens Balsamina, and (2) determine flavanoid compounds in Trifolium pratense and Trifolium medium and their influence on crossability of these species.
 Bot. 42

Plant Physiology and Nutrition

- Ariz. Basic Principles Involved in Trace Element Nutrition of Crops and Availability in Calcareous Soils. To (1) develop procedures for estimating availability to crops of micronutrients in calcareous soils; (2) investigate factors affecting availability of certain micronutrients in calcareous soils; (3) determine effect of different degrees of micronutrient deficiencies on crop yield and quality; (4) evaluate availability of different single micronutrient fertilizers to plants; (5) study inter-relationships between rate of applications of major elements to soils and micronutrient deficiencies; and (6) investigate fundamental behavior of soil and foliar applications of chelated micronutrients.
Hort., Agron., Range Mgt. 441
- Minn. Radiation as a Tool in Horticultural Crop Breeding. (1) Study mutagenic effectiveness of radiations upon several fruit and vegetable plants with respect to dosage, conditions, and time of radiation, and in relation to periods of growth, dormancy, and rest periods of plants and seeds. (2) Study effects of radiations on subsequent development of plants and seeds. (3) Produce mutations useful to fruit and vegetable breeders.
Hort. 2127 Coop. ARS
- Nebr. Effects of Various Types of Radiation upon Plant Metabolism. To make comparisons in the seedling and early growth stages of control plants and plants from irradiated seeds, with respect to the following: 1. Activities of certain enzymes, for example the oxidative enzymes, peroxidase and polyphenolase, and the enzymes which synthesize and destroy indoleacetic acid. 2. Cell size, mitotic activity, and contents of desoxyribonucleic acid and ribonucleic acid in root tips. 3. Contents of free amino acids in various plant parts. 4. The functioning of certain pathways of metabolism.
Agron. 613 Coop. AEC
- Tenn. Use of Ionizing Radiations in Crop Improvement. (1) Obtain plant material with characteristics giving improved agricultural value by inducing mutations, by inducing chromosome interchanges and other aberrations, by increasing crossing over between tightly linked genes. (2) Produce monosomics in polyploids, by centromere inactivation or asymmetric interchange. (3) Study effects of altering conditions before, during, and after irradiation on genetic effects of the rays.
Bot. 78 Coop. AEC

Poultry Husbandry

- Ark. Nutrition of Chickens for Efficient Commercial Broiler Production. (1) Learn interrelationships existing between some of essential amino acids when fed to chicks and obtain information to aid in preventing imbalances. (2) Study relationship of amino acid pencillamine to growth stimulating ability of penicillin when fed to chicks.
Anim. Indus., Vet. Sci. 273
- Colo. A Study of Intestinal Transit and Absorption of Radioactive Minerals and the Role of Vitamin D in Intestinal Absorption in the Domestic Fowl. To study (1) intestinal transit and absorption of radioactive Ca^{45} and other radioactive minerals, including observations on role of the ceca and other segments of the digestive tract; (2) rates of transit thru digestive tract of Ca^{46} and correlation of transit to absorption; (3) mechanism of vitamin D to learn its effect on intestinal absorption and bone metabolism.
Poultry 53
- Del. Genetic Differences and Gene-Environment Interactions in the Thyroid Activity of Chickens. (1) Study feasibility of using radioactive I tracer technique to establish relative thyroid activity. (2) Learn if there are significant genetic differences in thyroid activity of chickens. (3) Compare thyroid activity in "pure" breeds and their crosses in relation to any manifestations of heterosis. Learn (4) if thyroid activity is altered by variations in light, temperature, and humidity; if there are breed and strain differences in response; (5) if there are sex differences in thyroid activity, and if there are breed and strain differences.
Anim. and Poultry Indus. 44 (NE-6) (Also see NE-6, Genetic and Physiologic Bases for Poultry Improvement, Part 19.)
- Mo. Thyroid Activity of Chicken Laying Hens as Affected by Age, Season, Level of Production, Ambient Temperature and Light. To learn (1) level of thyroid activity of laying hens as to age, season, and rate of egg production; (2) effect of environmental temperature and light on thyroid gland activity of laying hens.
Poultry Husb. 296 (NC-43) (Also see NC-43, Physiologic Responses of Laying Fowl to Their Environment, Part 19.)

Soils and Fertilizers

Colo.

The Behavior of Natural and Artificial Phosphates in Calcareous and Alkali Soils, Including: Solubility, Chemical Activity and Availability to Plants. To (1) develop satisfactory methods of evaluating phosphate fertility status of calcareous and alkali soils; (2) determine comparative efficiency of different phosphate fertilizer methods for different crops under different systems of application, and (3) contribute to basic knowledge of nature of native and applied phosphate materials and their utilization by crops in calcareous and alkali soils.

Agron. 127 Coop. TVA

Ill.

A Study of the Chemistry of Zinc and Molybdenum in Soils and Requirements of Crop Plants for These Nutrients. To (1) determine chemical forms of zinc and molybdenum in Illinois soils; (2) determine forms of zinc and molybdenum in soils that are available to plants and minimum levels needed for normal plant growth; (3) correlate amount of zinc and molybdenum in soil with amounts found in plants grown thereon; and (4) determine equilibrium reactions between native soil forms and added zinc and molybdenum.

Agron. 15-360

Ill.

Soil Requirements for Magnesium. To (1) examine current procedures for determining exchangeable magnesium on a rapid routine basis and to adopt a procedure which can be used in soil testing labs; (2) locate soil areas with different amounts of magnesium and having different proportions of magnesium in exchange capacity; (3) locate soil areas which contain low amounts of exchangeable magnesium or have a low proportion of exchange capacity occupied by magnesium; and (4) determine relation of soil levels of magnesium to crop response and establish levels at which magnesium deficiency may be expected in different crops.

Agron. 15-363

Ill.

Ion Transport Mechanisms in Soils. (1) To study rate of diffusion as a function of moisture and other soil parameters and diffusion of ions in absorbing and non-absorbing media; (2) study mass transport of ions thru porous media as in flowing water; and (3) apply above information to leaching of nutrients and feeding of plant roots.

Agron. 15-368

- Mass. Soil-Fertilizer Phosphorus: Mechanism of Fixation and Release and the Role of Supplementary Materials in Increasing the Efficiency of Phosphate Utilization. To (1) compare different phosphate materials as sources of phosphorus for crops; (2) study further chemistry of fixation and solubilization of a. insoluble or fixed soil phosphorus; b. applied soluble phosphates, and c. applied insoluble phosphates; and (3) improve and develop methods for increasing the availability of applied and soil phosphorus for use by plants.
Agron. 10
- Mich. Availability of P to Crops Using P^{32} Fertilizers.
Soils 275.2
- Minn. Radioisotopic Investigations on Soils and Crops. To determine by field and greenhouse studies with P^{32} the immediate and residual use of different nutrients by various crops.
Soils, Engin., Agron. 2511 Coop. AEC, ARS
- Mont. Mechanisms Which Effect the Immobilization of Phosphorus in Montana Soils. To (1) measure on selected soils processes which have been shown to mobilize and make phosphates unavailable to plants; and (2) determine movement and penetration of phosphates in selected Montana soils.
Chem. MS 901
- N.J. Use of Radioisotope Techniques in the Study of Major and Minor Nutrient Elements in Plants and Soils. (1) Clarify mechanism of, and factors affecting foliar absorption of major and minor plant nutrient elements; (2) study different effects of adding $MnSO_4$ to different agricultural soils of State; and (3) study efficiency of water use of various plant species receiving irrigation (use radioactive water).
Soils 637
- P.R. The Role of Phosphorus in Tropical Crop Production. To determine (1) what part of the phosphorus fertilizer added to a soil is taken by the crop, and what part is fixed by soil; (2) rate of leaching of available phosphorus in tropical soils under lab conditions; and (3) rate of penetration of available phosphorus under field conditions.
Soils 19 Coop. USDA, Oak Ridge Inst. of Nuclear Studies

Vegetables

Idaho

Effect of Irradiating Russet Burbank Potatoes with Radio-active Fission Products upon Their Storage and Market Qualities, Disease Prevention and Killing of Nematodes Contained Within the Tubers. To learn (1) dosage of irradiation from fission products that will inhibit sprouting of Russet Burbank tubers; (2) effect of said treatment on taste, cooking and processing qualities, flesh color and greening of skin under normal retail conditions; (3) loss during storage due to rots, shrinkage, and sprouting compared to non-treated tubers; (4) temperature that will allow least moisture, sprout, and rot loss to treated tubers; (5) how long marketing can be extended by use of treatment and still receive consumer acceptance; (6) best time for using treatment to expect best results; (7) possible effect of irradiation of tubers in delaying expression of Verticillium wilt through modification of dormancy; (8) if said dormancy can be broken by use of ethylene or other chemicals; (9) if Ditylenchus destructor can be killed by irradiation without injuring table quality.

Hort. 268 Coop. AEC

Md.

Spontaneous and Induced Multiple Seedlings and Haploids of Zea Mays, Capsicum Frutescens and Other Economic Plants and Their Use in Plant Breeding. To (1) determine the frequencies and types in regard to number of members and chromosome numbers of spontaneous multiple seedlings and compare with the frequencies and types of multiple seedlings induced by X-rays or other agents; (2) determine the origin of spontaneous and induced multiple seedlings and compare differences or similarities in the modes of development of spontaneous and induced polyembryony; (3) establish degree of genetic control of spontaneous polyembryony; (4) ascertain the frequency of haploids among induced multiple seedlings and compare with the frequency of haploids among naturally occurring multiple seedlings; (5) utilize haploids in the development of superior new varieties; (6) evaluate resulting homozygous lines in field performance.

Bot. F-15b

Veterinary Science

Calif.

Pathogenesis of Ostertagia Circumcincta in Sheep. To obtain information on mechanism of disease production in more important parasitic helminths of ruminants, and try to elucidate and understand effect of these parasitic helminths on these physiological processes; (1) protein in metabolism, (2) mineral metabolism, (3) acid-base equilibrium, and (4) hematopoiesis.

Vet. Sci. 1636 (W-35) (Also see W-35, Internal Parasites of Ruminants, Part 23.)

Mich.

Basic Cell and Tissue Responses in Animal Disease. Use electron microscope, tissue culture, and radioactive tracers to learn response of cells to virus infections.

Anat., Physiol. 111

LIST OF COMPILATIONS OF FEDERAL-GRANT RESEARCH PROJECTS
AT STATE AGRICULTURAL EXPERIMENT STATIONS

| ARS-23-8: | | |
|-----------|------------------------------------|--|
| Part : | Subject-Matter Area | Title of Section |
| Numbers : | | |
| 1 | Agricultural Chemistry | Agricultural Chemistry |
| 2 | Agricultural Economics | a. Prices, Incomes, & General Studies of Com- modities & Industries b. Farm Management c. Land Economics d. Farm Finance & Taxation |
| 3 | Agricultural Engineering | a. Land & Water Use & Develop- ment b. Power Machinery & Equipment c. Farm Structures & Materials |
| 4 | Animal Husbandry | a. Beef Cattle b. Sheep & Goats c. Swine |
| 5 | Dairy Husbandry | Dairy Cattle |
| 6 | Dairy Technology | Dairy Technology |
| 7 | Entomology & Economic Zoology | a. Field Crop Insects b. Fruit, Nut & Vegetable Insects c. Miscellaneous Insects & Economic Zoology d. Insecticides |
| 8 | Field Crops | a. Cereal Crops b. Oil, Fiber, Tobacco & Sugar Crops |
| 9 | Food Science & Technology | a. Food Chemistry, Micro- biology, Sanitation & Public Health b. Food Engineering, Processing, Product and Process Develop- ment, Utilization and Waste Disposal c. Food Quality & Standards, Acceptance, Preference, & Marketing |
| 10 | Forage Crops, Pastures & Ranges | Forage Crops, Pastures & Ranges |
| 11 | Forestry | Forestry |

| ARS-23-8: | | |
|-----------|-----------------------------------|--|
| Part : | Subject-Matter Area | Title of Section |
| Numbers : | | |
| 12 | Fruits & Nuts | Fruits & Nuts |
| 13 | Home Economics | a. Human Nutrition b. Housing c. Clothing & Textiles d. Foods-Consumer Quality & Utilization e. Household Economics & Management |
| 14 | Economics of Marketing | a. Field Crops b. Fruits & Vegetables c. Livestock, Meats & Wool d. Dairy Products e. Poultry & Poultry Products f. Forest Products & Ornamental & Drug Plants g. Cross-Commodity & Functional Studies |
| 15 | Meteorology | Meteorology |
| 16 | Ornamental & Drug Plants | Ornamental & Drug Plants |
| 17 | Plant Pathology & Bacteriology | a. Plant Pathology, Botany, & Diseases of Miscellaneous Crops b. Diseases of Field Crops c. Diseases of Fruit Crops d. Diseases of Vegetable Crops |
| 18 | Plant Physiology & Nutrition | Plant Physiology & Nutrition |
| 19 | Poultry Industry | Poultry Industry |
| 20 | Rural Sociology | Rural Life Studies |
| 21 | Soils | a. Soil Chemistry & Microbiology b. Soil Fertility, Management & Soil-Plant Relationships c. Soil Physical Properties, Conservation & Classification |
| 22 | Vegetables | a. Vegetable Crops b. Potatoes |
| 23 | Veterinary Science | Veterinary Science |
| 24 | Weeds | Weed Control |

